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FISH & RICHARDSON PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
HUBER, ROBERT T	

ART UNIT	PAPER NUMBER
4146	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/578,960	MINIXHOFER, RAINER	
	Examiner	**Art Unit**	
	ROBERT HUBER	4146	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 May 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/10/2006, 12/11/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

a. Page 7, lines 9 and 11 have a "c." before the phrases "2 times greater" and "4 times greater". It is unclear what the "c." means or implies.

b. The table on page 13 includes numbers with the European convention. Please change or verify the number using the United States convention (e.g. verify that the number "17,61" of the second row, second column should read "17.61").

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 - 3, 12 – 14, 16, 17, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Fedotowsky (US 3,763,272).

a. Regarding claim 1, Fedotowsky discloses an optoelectronic component (e.g. figure 1) comprising:

a semiconductor device (device 10) comprising at least one radiation-sensitive zone configured to detect electromagnetic radiation (col. 3, lines 50 –

51, disclose it is a Schottky barrier sensor, and figures 8 – 10 show various embodiments of the sensor), and

an optical element configured to focus the electromagnetic radiation in the at least one radiation-sensitive zone (optical element 3, focusing electromagnetic radiation as seen in figure 1);

the optical element comprising a diffractive element having structures with sizes on an order of magnitude of a wavelength of the electromagnetic radiation (col. 3, line 47 discloses that element 3 is a "zone plate", which is a diffraction element. Col. 4, lines 15 - 16 disclose that the zone plate has "elevations" 15 with heights on the order of a wavelength).

b. Regarding claim 2, Fedotowsky discloses the optoelectronic component of claim 1, as cited above, wherein the diffractive element comprises a zone plate (col. 3, line 47 discloses that diffractive element 3 is a "zone plate").

c. Regarding claim 3, Fedotowsky discloses the optoelectronic component of claim 1, as cited above, wherein that the diffractive element is incorporated in the semiconductor device (e.g. as seen in figure 1, the diffractive element is incorporated in the semiconductor device consisting of substrate 1).

d. Regarding claim 12, Fedotowsky discloses the optoelectronic component of claim 1, as cited above, wherein the diffractive element comprises a layer

included in the semiconductor device (e.g. as seen in figure 14, the diffractive element 3 has a layer 7 included in the semiconductor device).

e. Regarding claim 13, Fedotowsky discloses the optoelectronic component of claim 12, wherein the layer comprises a metallic layer (col. 3, line 49, discloses the layer to be metallic).

f. Regarding claim 14, Fedotowsky discloses the optoelectronic component of claim 2, as cited above, wherein the zone plate of comprises a first transparent material having an index of refraction (n_1) and a second transparent material having an index of refraction (n_2), n_1 being different than n_2 (e.g. col. 7, line 57 - col. 8, line 9, discloses, and figure 13 shows, that the zone plate is made of silicon, with index of refraction 3.5, and an anti-reflective coating of silicon oxide, with index of refraction 1.5) .

g. Regarding claim 16, Fedotowsky discloses the optoelectronic component of claim 1, as cited above, wherein the diffractive element comprises a structured layer included in the semiconductor device (e.g. as seen in figure 1, the diffractive element 3 contains structures 7, 13, 15, and 16).

h. Regarding claim 17, Fedotowsky discloses the optoelectronic component of claim 16, as cited above, wherein the semiconductor device comprises an

integrated circuit (e.g. as seen in figures 8 – 10, there are various embodiments of the semiconductor device, which is an integrated circuit in each embodiment).

i. Regarding claim 20, Fedotowsky discloses the optoelectronic component of claim 1, as cited above, wherein the semiconductor device (device 10) comprises a semiconductor chip (e.g. figures 8 – 10 show various embodiments of the semiconductor device, which is a semiconductor chip in each embodiment).

4. Claims 1, and 4 – 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Meyers (5,682,266).

a. Regarding claim 1, Meyers discloses an optoelectronic component (e.g. figure 3) comprising:

a semiconductor device (sensor 18) comprising at least one radiation-sensitive zone configured to detect electromagnetic radiation (col. 2, lines 63 – 64 disclose electro-optical sensor elements 24A and 24B in the sensor 18), and

an optical element configured to focus the electromagnetic radiation in the at least one radiation-sensitive zone (optical element 12 (referenced in figure 2), focusing electromagnetic radiation as seen in figure 3);

the optical element comprising a diffractive element having structures with sizes on an order of magnitude of a wavelength of the electromagnetic radiation (col. 2, lines 42 - 44 discloses that element 12 is a diffractive element. Col. 3, line

28 discloses an equation in which the spacing **d** between grating features is on the order of a wavelength).

b. Regarding claim 4, Meyers discloses the optoelectronic component claim 1, as cited above, wherein the at least one radiation-sensitive zone is configured to detect electromagnetic radiation having a wavelength between about 100 nm and about 5 micron (e.g. col. 3, lines 31 - 40, disclose choosing a diffraction grating such that the center of the diffraction angle corresponds to a wavelength of 550 nm. Figure 3 shows the light rays falling on the sensors, with the light rays marked by their color R, G, B. All colors fall within the range of 100 nm to 5 microns).

c. Regarding claim 5, Meyers discloses the optoelectronic component of claim 4, as cited above, wherein the at least one radiation-sensitive zone is configured to detect electromagnetic radiation in the visible spectral region having a wavelength from about 400 nm to about 800 nm (e.g. col. 3, lines 31 - 40, disclose choosing a diffraction grating such that the center of the diffraction angle corresponds to a wavelength of 550 nm. Figure 3 shows the light rays falling on the sensors, with the light rays marked by their color R, G, B. All colors fall within the range of 100 nm to 5 microns).

d. Regarding claim 6, Meyers discloses the optoelectronic component of claim 1, as cited above, wherein a distance between the diffractive element and the at least one radiation-sensitive zone is less than about 20 micron (col. 3, lines 17 – 20, disclose the distance between the diffractive element and the sensor to be less than 500 microns).

5. Claims 1, 2, 7, 8, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Lehovec (US 3,569,997).

a. Regarding claim 1, Lehovec discloses an optoelectronic component (e.g. figure 5) comprising:

a semiconductor device (device including active regions 41 and 43, with electrodes 44 and 45) comprising at least one radiation-sensitive zone configured to detect electromagnetic radiation (zone 42, disclosed col. 4, line 17), and

an optical element configured to focus the electromagnetic radiation in the at least one radiation-sensitive zone (optical element on layer 40 with regions 2, 4, 5, 6 and 7);

the optical element comprising a diffractive element having structures with sizes on an order of magnitude of a wavelength of the electromagnetic radiation (col. 4, lines 5 – 8, disclose the element to be a zone plate, which is a diffractive element, as well as the opaque and transparent regions. Col. 3, lines 37 - 39 and figure 3 show that distance between adjacent regions of the diffractive element is on the order of a wavelength).

b. Regarding claim 2, Lehovec discloses the optoelectronic component of claim 1, as cited above, wherein the diffractive element comprises a zone plate (col. 4, line 3 discloses that diffractive element is a "zone plate").

c. Regarding claim 7, Lehovec discloses the optoelectronic component of claim 2, as cited above, wherein:

the radiation-sensitive zone is configured to detect radiation with a wavelength lambda (λ) (col. 4, lines 10 - 15 discloses the radiation sensitive zone as a photoconductive element); and

the zone plate is at a distance R from the radiation-sensitive zone and has a diameter D, wherein for a Fresnel number F of the zone plate: $F = (D^2/\lambda R) > 1$ (e.g. col. 8, lines 34 - 35 disclose the distance of the zone plate from the radiation-sensitive zone to be the thickness of the layer 40, which is 4 microns. Outer region 7 defines the diameter, as disclosed in col. 3, line 12, and seen in figure 5. Figure 3 shows that the radius of the zone plate is greater than $10\lambda/4$, and hence the diameter is greater than $20\lambda/4$. The reference discloses in column 8, lines 25 – 45, that λ = 1 micron and the distance R = 4 microns. Therefore, the zone plate has a Fresnel number of $F = (D^2/\lambda R) = (20*1/4)^2/(1*4) = 6.25 > 1$).

d. Regarding claim 8, Lehovec discloses the optoelectronic component of claim 7, as cited above, wherein a focal length of the zone plate for radiation with

wavelength of about 550 nm is from about 1 micron to about 20 microns (the focal length for a zone plate $r_n \approx \sqrt{n\lambda f}$, where n = the number of quarter wavelengths to the edge of the plate, and r_n is the radius to the nth quarter wavelength. As cited above, there are 10 quarter wavelengths to the edge, and the radius is greater than 10λ/4, as seen in figure 3. Therefore, for λ = 0.550 microns, the focal length is 3.75 microns).

e. Regarding claim 18, Lehovec discloses a method (e.g. with reference to figure 5) comprising:

using a zone plate (zone plate comprising regions 1 - 7 on tope of layer 40) to focus electromagnetic radiation into one or more radiation-sensitive zones (zone 42 with layers 41 and 43) of a radiation-detecting semiconductor device (device comprising layers 41 and 43, and electrodes 44 and 45).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 9 – 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lehovec in view of Iwaski (US 7,129,466 B2).

a. Regarding claim 9, Lehovec discloses the optoelectronic component of claim 1, as cited above. Lehovec is silent with respect to the at least one radiation-sensitive zone comprising a plurality of radiation-sensitive zones at varying distances from the optical element such that radiation-sensitive zones configured to detect shorter wavelengths of the electromagnetic radiation are disposed at greater distances from the optical element compared to radiation-sensitive zones configured to detect longer wavelengths of the electromagnetic radiation. Iwaski discloses a radiation-sensitive zone comprising a plurality of radiation-sensitive zones at varying distances from the surface that incoming light enters such that radiation-sensitive zones configured to detect shorter wavelengths of the electromagnetic radiation are disposed at greater distances from the surface where the incoming light enters compared to radiation-sensitive zones configured to detect longer wavelengths of the electromagnetic radiation (e.g. col. 6, lines 36 – 45, and col. 7, lines 35 – 41, with reference to figures 5A – 5E).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the radiation sensitive zone of Meyers to include multiple, stacked radiation sensitive zones such that radiation-sensitive zones configured to detect shorter wavelengths of the electromagnetic radiation are disposed at greater distances from the optical element compared to

radiation-sensitive zones configured to detect longer wavelengths of the electromagnetic radiation, since such devices were disclosed by Iwaski in relation to light detection. One would be motivated to make such a modification to combine the teachings of both references since it is well known in the art that optical elements will have diffraction focal lengths that are different for different wavelengths of light, and therefore stacked sensors detecting different wavelengths would allow one to more effectively detect discrete bandwidths of certain wavelengths (e.g. red, green, and blue).

b. Regarding claim 10, Lehovec and Iwaski disclose the optoelectronic component of claim 9, as cited above, wherein the radiation-sensitive zone is disposed in corresponding focal plane of the diffractive element (e.g. Lehovec discloses in col. 4, lines 20 - 21, that the incoming light is focused to point 42 of the radiation-sensitive zone). Lehovec is silent with respect to the multiple radiation-sensitive zones and corresponding colors, however Iwaski discloses the multiple radiation sensitive zone and corresponding colors (e.g. col. 6, lines 36 – 45, and col. 7, lines 35 – 41, with reference to figures 5A – 5E).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to combine the teachings of Lehovec and Iwaski such that each corresponding radiation-sensitive zone has a focal plane of the corresponding wavelength form the diffraction element. One would be motivated to make such a combination because it would allow for the most efficient light

absorption in the zone if all of the corresponding light was focused in its corresponding radiation sensitive zone.

c. Regarding claim 11, Lehovec and Iwaski disclose the optoelectronic component of claim 10, as cited above, and Iwaski further discloses the at least on radiation sensitive zone comprises (e.g. figure 5D):

a first radiation-sensitive zone in a focal plane of the diffractive element for wavelengths associated with red visible light (as seen in the figure, the topmost zone is for red light);

a second radiation-sensitive zone in a focal plane of the diffractive element for wavelengths associated with green visible light (as seen in the figure, the middle zone is for green light); and

a third radiation-sensitive zone in a focal plane of the diffractive element for wavelengths associated with blue visible light (as seen in the figure, the bottommost zone is for blue light).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fedotowsky. Fedotowsky discloses the optoelectronic component of claim 14, as cited above, but is silent the first transparent material comprises a silicon oxide and the second transparent material material comprises a silicon nitride. However, Fedotowsky disclose in col. 4, lines 25 – 28, that the antireflective coating on the zone plate may be made of a silicon nitride (Si_3N_4), and the reference further discloses in col. 8, lines 14 -

24, the process of making such a coating. One step involves oxidizing the silicon substrate, then removing part of the oxidized layer, then re-oxidizing for form another separate layer (e.g. as seen in figure 13, the thin and thick layers of silicon oxide on the silicon substrate).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the antireflective coating taught by Fedotowsky such that it has a layer of a silicon oxide and a layer of silicon nitride, since Fedotowsky states that a silicon nitride may be used in such a coating, and discloses steps of forming multiple layers of a coating. It has been held by the courts that selection of a prior art material on the basis of its suitability for its intended purpose is within the level of ordinary skill. *In re Leshing*, 125 USPQ 416 (CCPA 1960) and *Sinclair & Carroll Co. v. Interchemical Corp.*, 65 USPQ 297 (1945). One would be motivated to use a coating with a combination of silicon oxide and silicon nitride layers since it would alter the diffraction and anti-reflection properties of the zone plate, and allow one to adjust the patterns to yield desirable effects.

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lehovec in view of Iwaski. Lehovec discloses the method of claim 18, as cited above, wherein using the zone plate to focus electromagnetic radiation into one or more radiation-sensitive zones. Lehovec is silent with respect to

using the zone plate to focus electromagnetic radiation with wavelengths associated with red visible light into a first radiation-sensitive zone;

using the zone plate to focus electromagnetic radiation with wavelengths associated with green visible light into a second radiation-sensitive zone;

using the zone plate to focus electromagnetic radiation with wavelengths associated with blue visible light into a third radiation-sensitive zone.

Iwaski discloses using a sensor with many vertically stacked radiation-sensitive zones to detect red, green, and blue light (e.g. col. 6, lines 36 – 45, and col. 7, lines 35 – 41, with reference to figures 5A – 5E).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the method of using a device with a singe radiation sensitive zone such that it includes multiple radiation sensitive zones, which are sensitive to red, green, and blue light, since Iwaski discloses that radiation sensitive zones may comprise such elements and be used to detect light. One would be motivated to make such a modification in s since it is well known in the art that optical elements will have diffraction focal lengths that are different for different wavelengths of light, and therefore stacked sensors detecting different wavelengths would allow one to more effectively detect discrete bandwidths of certain wavelength (e.g. red, green, and blue).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT HUBER whose telephone number is

(571)270-3899. The examiner can normally be reached on Monday - Thursday (8am - 5pm EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marvin Lateef can be reached on (571) 272-5026. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Huber/
Examiner, Art Unit 4146
March 6, 2008

/Marvin M. Lateef/
Supervisory Patent Examiner, Art Unit 4146